

Saffron in Perfumery and Flavors

A meditation on the art and science of flavor and fragrance creation

Arcadi Boix Camps, Auram Art & Perfume

My friends often tell me that I do not look my age. Maybe they do it to please or flatter me, but maybe it is true. I believe human beings have two ages, the chronological and the biological. There is a time when those ages are relatively close together, but the differences between them do grow over time. This I know, because I feel exactly as I did when I was 22 or 23 years old.

Let me tell you one secret that I have never told to anybody but my closest friends: Since the age of 18, I have started every morning with a glass of iced Spanish saffron infusion, which imparts a sensation of youth, energy and strength inside my body.

Not long ago, I thought to analyze saffron. It is well-known that saffron contains: approximately 0.4–1.4% essential oil; yellow flavonoids that are derived from the diterpene, crocetin; bitter substances, including picrocrocin and safranal (one of the compounds that imparts the characteristic aroma of saffron); β -hydroxycyclocitral; 2-butenoic-acid-lactone; carbohydrates; β -carotene; γ -carotene; cineole; copper; crocin 1-4 (disaccharide analogs of crocin, such as crocin-1 and crocin-2, are less potent than monosaccharide analogs, such as crocin-3 and crocin-4, in improving eyesight); and crocose. The stigmas also contain: 8.5–16% water; 6–13% fixed oil; oleanolic acid derivatives; oleic acid; 4.3–4.8% fibre; 12.6–13.6% protein; 12–13% starch; lauric acid; lycopene; manganese; 2.2–2.4% nitrogen; thiamine; xanthophylls; and zeaxanthin.

As a flavorist and perfumer, I, of course, wished to delve deeper into the 0.4–1.4% of essential oil.

Modernity, Science and Wisdom

I was hesitant to delve deeper into the composition of saffron because I believe our lives require mysteries, myths, emotions, dreams, hopes and, above all, the special character of wisdom. Wisdom can reveal things that art, science, knowledge and learning cannot. Knowledge and learning have steadily increased over the centuries, but the same progress hasn't been achieved in wisdom. The individual may grow in wisdom, but society and humanity sadly have not.

Lovers of modernity—world leaders in the establishment, those with great influence and economic power, whom we call technocrats—may assert their superiority over the ancients in all the sciences, but they cannot claim

superiority in wisdom. The terms “modern science” and “modern knowledge” need no elucidation, but if one were to speak of “modern wisdom,” an explanation would be in order. Just as “modern” seems to have an immediate affinity with “science,” so “ancient” does with “wisdom.” Sadly, it is this latter quality that has been lost. If we aren't able to reverse this reality, we will inherit a wasteland, on which I've expounded in previous writings. Without the spirit, myths and mysteries—the keys of human greatness and creativity—we face a desolation of the soul.

This is what gave me pause before seeking the logical and scientific goals of analyzing the volatile part of saffron essential oil. To me, saffron is part of the unknown mystery of the world, its subjective energy. However, I value science and knowledge highly. I dream of a time when science, knowledge and wisdom will progress simultaneously—a time that is unfortunately not ours.

Although it seems nothing is moving on a calm and wonderful Spanish night when I am relaxing on my terrace, everything is moving at high speed. The optimistic truth is that all of us—believers in the French or Soviet Revolutions, followers of Socrates, Plato and the other great philosophers, and those that only care for science and knowledge—coexist together on Earth, which travels at 30 km/sec around the sun, which itself hurtles at 217 km/sec in a journey that spans 225 million light-years around the Milky Way. Simultaneously, our galaxy is also moving at a rate of 140 km/sec toward the neighboring—and much bigger—Andromeda galaxy. This is how the universe works. Our sun is just a spec in one of the outer bands of the Milky Way, which has around 200 billion stars, while the “neighboring” Andromeda possesses around 1 trillion—five times the stars, planets and, to be sure, life. Considering the great scale of things, I've come to realize that those of us with faith in the spirit, mysteries, myths, emotions, wisdom and the foundations of Western culture will prevail over an age that has rendered people as mere consumption objects.

Further Topics in Perfumery

Previous editions of Arcadi Boix Camps' writings are available for review and purchase at www.perfumerflavorist.com/camps.

Analysis

I decided to start working with my humble means and my good quality GC/MS to try to understand the chemical reality of the saffron essential oil or absolute. To do this, I wanted Spanish saffron, since Spanish saffron is generally accepted as being the best in the world. Thirty years ago, Spain dominated the market in saffron. Now, however, the country produces only around 1,500 kg of saffron with the official denomination of “Mancha,” and around 1,500 kg of pure Spanish saffron without the official denomination of origin (a product that is as good as Mancha, but slightly cheaper).

Few people are exposed to the pure Spanish oil, since 95% of today’s world production is Iranian-derived, due to a cheaper price. Most of the “Spanish” saffron sold on the market is just a mixture of the genuine Spanish and Iranian varieties. I do not wish to offend the industry’s Iranian colleagues, because they have learned a lot of the key stigmal drying processes, but I have tasted both the real Spanish and Iranian varieties and feel the Spanish is better. (I assure you I do not say this as a nationalist.)

The same is true for the disappearing sandalwood tree. The sandalwood oil distilled from a 40-year-old Indian tree is better than that sourced in Africa or Australia. It will always be this way.

Characteristics: Saffron is derived from the saffron crocus (*Crocus sativus*).¹ The flower’s three red stigmata are collected and dried before use as a spice or coloring agent. In the Middle East, particularly Iran, Turkey and Syria, and in the Indian subcontinent, saffron is used in delicious sweets and ice creams. Unfortunately, this tradition has not spread to Europe, Japan or the United States, where it is only used in rice preparations, or sauces paired with fish and seafood dishes. By weight, saffron is the most expensive spice. Pure Spanish varieties with origin denomination cost €2,000/kg in bulk (or US\$2,700 at today’s horrible exchange rate).

Saffron’s characteristic scent and taste are due to many ingredients, including picrocrocin, safranal, carotenoid dye and α -crocin, which imparts a rich golden-yellow hue to food. The spice is used extensively in Asian perfumery, particularly traditional Indian perfumery, where the original “saffron attar” is pro-

duced by co-distilling Kashmir saffron with sandalwood. (Safranal also has many medicinal applications.) Saffron is also employed widely in the Middle East, and beginning to find use in Western perfumery. In the West, formulators don’t use the natural product, but rather synthesized safranal.

My company continues to create saffron attar, but because of the sad reality of sandalwood, it has become necessary to co-distill the saffron with a sandalwood reconstitution commercialized by us, Sandalwood 10698-2/D, in addition to a captive heart called Sandalauram 10262/D. The result is very good.

The investigation: I began my investigation by creating a saffron absolute from the dried top-quality Spanish

variety—100% alcohol-and lipo-soluble—and extracting from this 0.4–1.4% of essential oil. This scenario does not exist in the commercial world; the resulting material is far too expensive. What we formulators actually have at our disposal are water-soluble extracts that, of course, contain not just the absolute, but many additives that are good for human health but have nothing to do with the traditional taste and odor of the volatile essential oil. While it is reported that saffron may yield 1.4% essential oil, to my astonishment, the Spanish variety I extracted achieved just about 0.3%. It should, however, be noted that I did my best to keep only the most volatile fraction and tried to avoid the one containing oleic, linoleic and linolenic acid. The cost—not the selling price—of producing this absolute would be around \$900,000 per kg. The resulting absolute wasn't as thick as jasmine absolute; it possessed a deep dark red color and smelled extremely strong of the spice. Perhaps I made a mistake in the extraction—after all, my company it is not a huge multinational like Givaudan, IFF, Firmenich or Symrise, nor does it possess their extensive means. Still, isolated among Cabrils' mountains, I must say that the extracted product both smelled and tasted supreme. It had the typical liquorish, hay-like smell of saffron. The first thing I wished to do was smell the material's individual components separated through the GC in order to try to rationalize which ingredients were olfactively most important. After all, I am convinced that odor and taste are deeply related. So I did it.

Analysis: There is a tendency for people to say that picrocrocin and safranal are the only “active” ingredients in saffron flavor. This is completely false. The absolute contained at least 170 peaks, some of them odorless. These included those with a particular metallic smell, others with strong but non-saffron characterizing odors, a number of esters or products not related to saffron odor, and finally some extremely strong saffron characterizing odorants that I found more powerful than safranal. It is said that safranal comprises around 70% of the volatile fraction, but this was not true in my absolute, in which the largest peak in the chromatogram was ethyl linoleate. Around this peak I found ethyl stearate, ethyl oleate, ethyl linolenate and many stearoptenes, along with traces of oleic, linoleic, linolenic and stearic acids—although I purposely cut the extraction to exclude acids. Naturally, ethyl oleate, ethyl linoleate and ethyl linolenate are not specifically saffron ingredients; however, they occur quite often in nature and are part of key naturals, including jasmine absolute, violet leaf absolute, narcisse absolute, osmanthus absolute, mimosa absolute, orange flower absolute, neroli bigarade oil, the virtually unknown and wonderful lemon flower absolute and lemon neroli oil.

Lemon neroli oil and indole: This material is not used in perfumery and is unknown to most perfumers. The living flower contains around 20% indole; pure, 100% natural indole is distinct from common commercial indole, which is full of impurities such skatol that greatly

distort the real smell of pure indole. Pure indole, as I discussed with Edmond Roudnitska many times, is only produced by one specific company in the world, which uses it for internal purposes and does not sell it. This explains the material's obscurity in perfumery. Indole is a supremely floral and delicate chemical. The material figures prominently in the works of Roudnitska, my good friend and teacher, who deployed the captive chemical in *Le Parfum de Therese*, *Eau Sauvage* and *Diorissimo*, among many others.

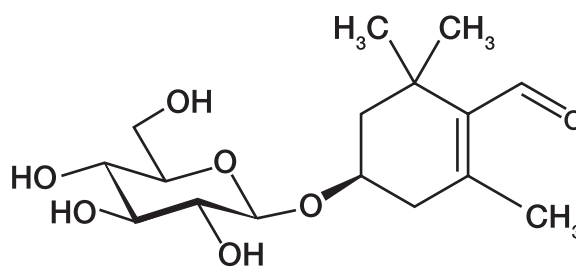
Esters and acids: I do not know if the ethyl esters and other unsaffronlike chemicals are important in saffron or reaction chemicals because I used ethanol for extraction. It is well-known that saffron contains the acids. I need to say that I could not trace the methyl esters, but ethyl linoleate was present in greater amounts than safranal in my absolute, so I tend to believe that the component occurs naturally in the product. If not, I must openly say that it works well in the absolute, which possesses a wonderful smell and taste. And naturally, the product is much better than the so-called “great” safranal.

Safranal: When safranal synthesis began in the industry, I was scared because I loved saffron and knew that, in today's environment where most people lack sensorial nuance, safranal was going to become synonymous with, and eventually replace, saffron—just as citral became lemon, Ambrox (Firmenich) became ambergris and skatol became civet. I wonder where this olfactive ignorance came from. Ambrox, the laevo isomer, is a fantastic chemical, no doubt about it. It has “ambery” and woody connotations, but it is not at all ambergris, which is by far a much more complex product. Ambergris is more fecal than “ambrox,” having important shades of tobacco, seaweed and indescribable olfactory richness. What about α -ambrinol, its epoxide, homocyclogeraniol chloride, ambraldehyde, dihydroactinidiolide, dihydro- γ -ionone, the naturally occurring pyrazines and so many other important ingredients? Are they nothing? Are they odorless? Why should we say that using Ambrox is synonymous to using ambergris, when in reality Ambrox is a wonderful and distinct chemical in its own right? Though I am afraid I am preaching to the deaf, I would like to conclude by noting that safranal, although a good ingredient smelling of saffron, is not the only indispensable ingredient, nor is it even the most powerful chemical occurring in the volatile fraction of saffron. I use the term “powerful,” because the subjective term “quality” is in decline. Only objective and rational terms such as “strength” are taken into consideration.

Picrocrocin: The glycoside picrocrocin (see F-1)—4-(β - δ -glucopyranosyloxy)-2,6,6-trimethylcyclohexene carboxaldehyde, $C_{16}H_{26}O_7$ —is partially responsible for saffron's flavor. The material is comprised of an aldehyde and a carbohydrate. The harvested and dried stigmas eventually yield the products of a cleaved picrocrocin: d-glucose and a safranal molecule.¹ Many important chemicals in addition to safranal give saffron much of its distinctive aroma. Picrocrocin is more bitter than safranal and other characteristic chemicals, which together comprise 60–70% of dry saffron's volatile fraction.

Picrocrocin

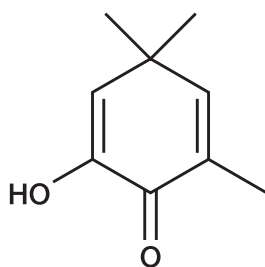
F-1



As I said before, my fraction contains unsaffronlike constituents that combine with pure saffronlike ingredients in the final olfactive harmony found in my absolute. There is a profound difference between my absolute and safranal—simply night and day! What a pity that I cannot have this absolute on my perfumer's/flavorist's shelf.

Mystery peak: One of the great smelling chemicals found in my absolute remains a mystery to me. The material is the third in quantitative importance after ethyl linoleate and safranal. In Carbowax, it elutes after β -phenylethyl alcohol, a minor constituent of saffron, and 4-hydroxysafranal. This mystery peak's spectrum has all the ions of β -cyclocitral ($C_{10}H_{16}O$, MW 152), but shows an undisputable molecular weight (mw) of 196. After reflection, I believe it must be one of only two possibilities. The first option is 4-formyloxy- β -cyclocitral ($C_{11}H_{16}O_3$, mw 196.11): picrocrocin undergoes enzymatic hydrolysis to afford 4-hydroxy- β -cyclocitral, which in turn formylates to give 4-formyloxy- β -cyclocitral (m/e 196.11). The latter loses CO_2 in the GC/MS, generating an ion typical of β -cyclocitral (2,6,6-trimethylcyclohex-1-enecarbaldehyde). However, since I could not synthesize those chemicals at Auram, the mysterious peak could also be 4-ethoxy- β -cyclocitral ($C_{12}H_{20}O_2$, mw 196). This is very interesting because the material could be an artifact—although it carries the extremely smooth-spicy smell of saffron, with elegant velvety nuances—from 4-hydroxysafranal via exchanging hydroxyl with ethanol in my extraction process. But since ethanol is naturally obtained from acetaldehyde, where it is bio-produced in the cell in a manner similar to glycosylation, safranal could add ethanol in a 1,6-addition. However, I tend to believe that the hydroxy group at the 4-position of β -cyclocitral is not sufficiently activated by the remote electron-withdrawing aldehyde group to be effectively exchanged by ethanol.

Because safranal is abundant in saffron, it is susceptible to these reactions. Therefore, I believe the mystery peak is 4-ethoxy- β -cyclocitral, since a formyl group is not hydrolytically stable. I applied ethanol for the extraction of saffron, and because this is a lengthy process carried out under heat and humidity, the formyloxy group might not have survived. In addition, in my spectrum, I can see ions 43 or 45 in MS as a residue of the EtO part. Could the mystery peak be an artifact of such a fantastic chemical with such a beautiful, smooth and velvety saffron



smell? Perhaps, but perhaps not; 4-ethoxy- β -cyclocitral could form via 1,6-addition to safranal, not via exchange with 4-hydroxy- β -cyclocitral. I am not too concerned with this since hedione emerged out of the research done on methyl jasmonate. Could this be a fantastic newly discovered chemical? Why not?

Safrandione: Safrandione—2-hydroxy-4,4,6-trimethyl-2,5-cyclohexadien-1-one—is a true jewel (see F-2). The material is synthesized in large quantities by a fragrance and flavor company that, not coincidentally, wins the most important saffron briefings. Safrandione is much stronger than safranal; a good saffron effect can be achieved when both materials are combined. However, we really approach true saffron when mixing safranal; Safrandione; 4-hydroxysafranal; 4-hydroxy- β -cyclocitral; my possible artifact, 4-ethoxy- β -cyclocitral (because it smells great); 4-hydroxyisophorone; oxo-4-hydroxysafranal; oxo-4-hydroxy- β -cyclocitral; oxophorone (4-ketoisophorone); dihydrooxophorone; isophorone; 2-hydroxyoxophorone; hydroxymethylene isophorone; 3-hydroxy-oxo- β -cyclocitral; 3-oxosafranal; oxo- β -cyclocitral; β -cyclocitral; and some other key chemicals recently discovered in this work, which took me several months of hard effort. The result, as I said, is true saffron, which is not the pungent safranal, but rather a deeply liquor-like herbal-hay smell which is primarily achieved by Safrandione.

I was quite happy with the fruits of this research: smelling and tasting most of the ingredients one by one at a level of evaluation. This work resulted in a superb reconstitution of the coveted spice, our Saffron Concentrate 54246/D, and although I cannot really use the natural absolute because of the exorbitant cost price, I came relatively close to it in the reconstitution—infinately closer than simply using safranal. I even included some degree of the carotenoids naturally occurring in the spice. The whole product is used in our medium-price saffron attars in which we cannot afford to co-distill with Sandalwood 10698-2/D and Sandalauram 10262/D, the pure and costly spice.

Many of the chemicals I mentioned earlier are equal to or better than safranal. Safranal plays an important role in the natural spice, but it is in no way synonymous with saffron. If I had to choose between safranal and Safrandione, I would say Safrandione is the saffron key. The hidden soul of saffron can be achieved via the

combination of safranal and Safrandione with the hydroxyl, oxohydroxy, ketohydroxy, oxoaldehyde, aldehyde and ketone structures previously mentioned. This heart can be completed using ethyl linoleate, linolenate, oleate (which imparts warmth), 5-hydroxymethyl furfural (which is necessary to achieve olfactory and taste harmony),^o furaneol (Firmenich), 2(5H)-furanone, vanilla absolute, vanilla extract CO₂ (Firmenich) and the indispensable and virtually unknown “sugar pyranone,” 2,3-dihydro-3,5-dihydroxy-6-methyl-4H-pyranone. When mixing all of these elements, I can say I use “saffron” in my flavor and fragrance creations.

^o5-Hydroxymethyl furfural is also used in flavors such as vanilla and pineapple in order to increase the natural herbal, sugary aspects present in the natural product.

Saffron in Perfumery

I've frequently used saffron in perfumery because it is an indispensable ingredient of what we call “East-West” and Oriental accords. True saffron attar, a treasure which has sadly almost vanished, contains the full range of saffron volatiles co-distilled in a sandalwood medium. In this genuine, pure form, it has an herbal-hay (the best adjective for describing saffron), milky-woody and honey character that mixes extremely well with the so-called shamama-tul-amber attar and agarwood oils. (Shamama-tul-amber attar, in its genuine form, is a co-distillation of herbs, roots, spices, flowers, deer musk powder (in the top qualities), mosses, woods and other secret products in Indian sandalwood oil.) Saffron attar also mixes very

well with exotic and unknown flowers such as frangipani, champaca, magnolia, gul hina (flower of paradise), kewra, gardenia, jasmine sampac and auriculatum, and the extraordinary nittymallige. In fact, the range of materials with which saffron attar mixes well is vast: orris derivatives, such as the absolute or the concrete; Burley tobacco absolute; osmanthus absolute, with which the attar forms accords of extreme olfactory beauty possessing a fruitiness that is in the heart of many of my successful creations; opoponax; irone; and the extraordinary dihydro-irone, the coveted and heavenly “myrrhone.” Dihydro-irone is far less orrislike, and more closely resembles opoponax and myrrhlike than irones. The height of irone beauty is achieved by mixing several isomers, including the most wonderful material (still commercially available), Irone V, which was synthesized by Roure-Bertrand & Dupond (now Givaudan). While the material is about five times more expensive than regular α -irone, it is 50 times better.

These accords are even better when using ethyl maltol, homofuroneol (methyl furaneol)—provided one knows how to handle the strength of this product—and the previously described sugar pyranone that I use in each and every of my formulae. This accord also works well with the megastigmatrienones (tabanone), khus oil, dihydrotabanone, the damascones, Pomarose (Givaudan), the oxoedulans, oxodamascones and the fantastic β -oxo-ionyl isobutyrate.

Selecting an agarwood: At this point, one must add the agarwood oils, primarily those of Indonesian origin. Indian, Bangladeshi and Burmese varieties are too fecal, and distort woodiness and fruitiness. Chinese, Laotian and Vietnamese varieties are too phenolic-cresolic. Indonesian (Pokambaru, Kalimantan, Jayapura and Mereke varieties), Thai (Prachinburi), Cambodian (Trat) and Malaysian agarwood oils are more palatable to Western tastes.

It should be noted that Cambodian agarwood oils from the Cardamome Mountains in the wild and mysterious countryside are designated as what we call the “Trat”^{***} quality of agarwood (one of the most expensive). When mixed with the perfect fruity accord previously described, this variety of agarwood oil imparts an almost indescribable sweet, fruity, honey, woody and slightly animalic odor that is extremely long-lasting. As stated before, the fruity accord also blends well with Indonesian varieties of agarwood oils—10781-2/D, 10781-2/D and 10781-4/D—products that cost one tenth of other agarwood oil types and can be produced by the ton.

Rose: Finally, to produce an extraordinary traditional Middle Eastern oriental royal fragrance using this fruity, honey, saffron-hay, woody-agarwood accord, we need to add rose. To me, the best natural rose is the Indian variety distilled in Aligarh, not far from New Delhi. However, here again we deal with an extremely expensive ingredient, used by us when making fragrances for the royal families of the Middle East, but the general market cannot afford them. For this reason, I have created our Rose Absolute 10141/D, Rosessence Supreme 10452/D and Rosessence 12689/D, which, though difficult to describe, are very well appreciated by the market.

The Formulas

I include herewith two oriental perfume formulae employing large amounts of saffron—*Royal Harmony* and *Royal Charisma*.

Royal Charisma

Linalol (BASF)	10.0 ^{***}
*Methyl pamplemousse 10%	5.0
Benzyl acetate	10.0
Gardenia Supreme L.F. 10808-2/D (Auram)	3.0
Dihidromircenol	9.0
Dimetol (Givaudan)	1.0
cis-Rose oxide (Symrise)	1.0
Bergamot Reggio essence	20.0
Saffron Concentrate 54246/D (Auram)	2.0
Rosessence 10452/D (Auram)	5.0
Muguet du Loire 10129/D (Auram)	65.0
Hyacinth 10297/D L.F. (Auram)	12.0
Muguet Orleans 10125/D (Auram)	23.5
Tuchka 10170/D (Auram)	4.0
Rose Supreme 10800-3/D (Auram)	80.0
Jasmine Absolute 10617/D (Auram)	10.0
Jasmine Sampac 20345/D (Auram)	41.0

^{***}So named for Trat Province of Thailand, near the Cambodian border.

Muguetanol (Symrise)	7.0
*Damascone α 10% DEP (Firmenich)	3.0
DBC acetate (IFF)	4.0
Geranyl acetate (IFF)	2.0
Rose Absolute 10141/D (Auram)	35.0
cis-3-Heptenyl acetate 10% DEP	10.0
Girofle des clous essence	10.0
Copaiba distilled essence	2.0
Gul Hina Attar 26210/D (Auram)	60.0
Saffron Attar 20830-2/D (Auram)	40.0
Geranium Bourbon essence	3.0
Agarwood Bio 10781-6/D (Auram)	15.0
Kephalis (Givaudan)	3.0
γ -Metilionona coeur (IFF)	12.0
Khusinil (IFF)	1.0
Frangipani leaf absolute	0.5
Allyl amyl glicolate (IFF)	3.0
Nirvanol (Firmenich)	7.5
Sandalwood 10698-2/D (Auram)	12.0
Canthoxal (IFF)	2.0
Koavone (IFF)	2.0
Shamama Attar Supreme 10337/D (Auram)	65.0
Soft Wood 10183/D (Auram)	2.0
Dihydroeugenol	1.5
Hexadecanolide (IFF)	1.0
Rosaphen (Symrise)	7.0
Vertofix coeur (IFF)	10.0
Dextro nor limbanol (Firmenich, Takasago)	2.0
Dihydroirone	7.0
Musk ketone	3.0
Celestolide (IFF)	3.0
Tonkinmusk 10236-2/D (Auram)	1.0
Amyris essence	25.0
Trisamber (IFF)	9.0
Tetrahydro ethyl safranate	1.0
Cedarwood Virginia essence	5.0
Coumarin	6.0
Aurelione (Symrise)	7.0
Ethyl maltol	7.0
Phenylethyl phenylacetate	3.0
Tonalide (PFW)	20.0
Hedione (Firmenich)	25.0
Helional (IFF)	3.0
Heliotropine	5.0
Hercolyn/D	25.0
Lilial	15.0
Lylal (IFF)	20.0
Benzyl salicylate	13.0
Galaxolide 50 (IFF)	50.0
Vanilla CO ₂ extract (Firmenich)	1.0
cis-3-Hexenyl salicylate (Symrise)	8.0
Laevo muscone	8.0
Iso- γ -Super (IFF)	35.0
Levosandol (Takasago)	5.0
Alcohol TCD DM	25.0
iso-n-Amyl salicylate	7.0
Patchouly Super Light essence (Ventos)	15.0
Sandela (Givaudan)	15.0
Laevo Cetalox (Firmenich)	4.0
	<hr/> 1,000.0

^{***}units are per thousand (total weight of the formula); *ingredient used in solution

Royal Harmony

Orris Absolute 10851-2/D (Auram)	10.0 ^{***}
Rosessence 10452/D (Auram)	189.0
Mantri India essence	25.0
Cardamom extract CO ₂ (Danisco, Firmenich)	5.0
Saffron Concentrate 54246/D	1.0
Sandalwood EC 10698-2/d (Auram)	60.0
Saffron Attar 20830-2/D (Auram)	15.0
Indian rose oil pure	3.0
Sandalore (Givaudan)	1.0
Osmanthus Absolute 10280/D (Auram)	5.0
Agarwood Neobio 10781-5/D Jayapura (Auram)	565.0
Maltarome 10134/D (Auram)	5.0
Gardenia Supreme L.F. 10808-2/D (Auram)	25.0
Javanol (Givaudan)	1.0
Iso E Super (IFF)	40.0
Iso-γ-Super (IFF)	5.0
Shamama Attar 10174/D (Auram)	50.0
	1,005.0

^{***}units are per thousand (total weight of the formula)

These are extremely good examples of what we can do with saffron in perfumery.

The Role of Memory and Imagination in Creation

Our profession is very beautiful and, whether creating fragrances or flavors, requires a lot of memory and imagination. The flavor industry is becoming increasingly extraordinary and attractive due to the discovery of new, impressive, beautiful and expensive chemicals. For example, products like ethyl *cis*-4-octenoate, methyl *cis*-4-octenoate, methyl *cis*-4,7-octadienoate and ethyl *cis*-4,7-octadienoate have revolutionized the concept of pineapple, which was previously accomplished with a more limited palette of ethyl acetate, isoamyl acetate, allyl caproate, methyl caproate, ethyl caproate and allyl cyclohexyl propionate. These new materials— including methyl-*cis*,4,7-octadienoate (Anapear [Givaudan]), which is being used to modify the top notes of many fragrances, imparting a very nice fruity nuance—can be used in both the flavor and fragrance industries.

As the quality of the profession advances, technology alone is not enough. If we wish to improve our art and craft and dominate contemporary technology, our core values must be memory and imagination. Memory and imagination depend upon sense perception and previous experience. Except for illusions of memory, we do not recall objects, emotions and desires we have never previously perceived. However, the imagination, an important part of the creative process, is not limited by prior experience; we can conceive of things we have never or could never perceive.

Creation and memory: It is not easy to describe the ingredients of the creator's palette without fully summoning them from memory. If we imagine freshly cut grass, we cannot help but recall the smells of *cis*-3-hexenol and its esters, in addition to the wonderful *cis*-3-heptenyl acetate. If one wishes to create a Japanese tea flavor, even with full knowledge of the chemical composition of Assam or Darjeeling teas, the formulation cannot be accomplished without having one of its keys, 1-hexene-3-ol, committed to memory. Similarly, one can never make a cherry flavor with just benzaldehyde, but rather through a wise combination of several important chemicals, including the expensive but indispensable 2-octen-4-one.

Importance of description: The flavor and fragrance profession is becoming more and more fantastic at a time when it is also becoming increasingly complicated. Just a few years back, who knew about Safrandione, the key herbal-hay note in saffron? Even now, how many people know it? However, the growing range of impact chemicals, which are so important in modern fragrances and flavors, need to be assimilated and properly described in order for us to be able to understand them.

The term philosophy varies widely in the world of perfumery and flavors as a term of evaluation. On the descriptive side, the meaning of the word ranges from a conception of philosophy that covers all branches of scientific knowledge, which contrasts with the philosophy of poetry, history and religion, to a conception of philosophy in which the primary point is its contrast to science and its association with poetry as works of "vision" or "belief," rather than of "knowledge." On its evaluative side, "description," when applied to an accord, fragrance or flavor, sometimes eulogizes the love and search for truth, the pursuit and even the attainment of wisdom. This is the point I made at the start of this article when I feared going too deep into the knowledge of "eternal" saffron.

Balancing Philosophy and Technical Demands

When thinking of my saffron work, I realize that life will never be limited to research or knowledge. My work with saffron has been difficult because, although I am very much engaged in my work, I feel quite isolated as I practice my craft far from the research teams of the multinational companies. While they have great resources, I have only my enthusiasm, humble chemistry knowledge and GC/MS. In the past, when a wiser society existed, the great Roman Emperor Marcus Aurelius asked "What is that which is able to conduct a man?" and he replied, "One thing and only one thing, philosophy." Philosophy, he said, keeps the inner man "free from violence and unharmed, superior to pains and pleasures, doing nothing without a purpose."

When thinking of this work on saffron, done with romanticism, scant means and perhaps incertitude, I think of my philosophical origins. One of my heroes of the wise ancient world, Epictetus, possessed a concept of philosophy as a moral discipline, which created that sense of a world in which the familiar injunction to a person in distress—"be philosophical"—carried the same meaning

as "be stoic." Philosophy, according to Epictetus, provides only peace of mind, not worldly riches or external power, as mentioned in the poem—"Ithaque" (or "Ithaca")—which appeared in my article "Perfumery: Techniques in Evolution, Part V" in the June 2004 edition of *Perfumer & Flavorist* magazine. Epictetus also said that "philosophy does not promise to secure to man anything outside himself," and he continued:

Do you suppose that you can be a philosopher if you do as you do now? No, you must sit up late, you must work hard, conquer some of your spiritual desires ... If you are willing to pay this price for peace of mind, freedom, tranquility, do not try to be first a philosopher, then a tax-collector, then an orator, then one of Caesar's procurators. These callings do not agree ... You must be busy either with your inner man, or with things outside; that is, you must chose between the position of a philosopher or an ordinary man.

I believe none of us is a true philosopher; many so-called philosophers, in fact, if we take the word of Epictetus with strictness, are ordinary beings—there was only one Protagoras, Socrates, Plato, Epictetus, Aristotle. However, while we may discover and achieve great things through science, we will be wiser if we understand that we will never know everything.

Humility is indispensable to wisdom. And just as we need to keep learning through scientific inquiry, we need to regain our lost wisdom. If not, we will be lost in a growing wasteland. I am speaking here of a desolation of the soul, spirit, myths, illusions, hopes and desires—the very essence of humanity. We need to recover our humanistic soul, our "human" mind. The mind's purpose is not solely for reason, intellect and understanding. Intelligence, consciousness, spirit, soul and wisdom are just as integral to its function. A true philosopher's mind is a part of the spirit and soul, connoting a substantial, but immaterial, mode of being. With this in mind, I declare what the great painter Gauguin once said with tears in his eyes:

Hommes de science, respectez ces pauvres artistes parce qu'ils sont toujours et seulement des petits pauvres enfants.

"Men of science, respect these poor artists, because they are only and always small poor children."

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1. http://en.wikipedia.org/wiki/Saffron_crocus

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